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# On the Conceptualization of Strategic Information Technology Alignment: Development and Validation of a Multidimensional Construct

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### Recommended Citation

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<https://aisel.aisnet.org/acis2013/78>

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## Information Systems: Transforming the Future

**24<sup>th</sup> Australasian Conference on Information  
Systems, 4-6 December 2013, Melbourne**

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## On the Conceptualization of Strategic Information Technology Alignment: Development and Validation of a Multidimensional Construct

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### Abstract

*In this study we conceptualize strategic information technology (IT) alignment as a two-way relationship where business strategy influences IT, and IT influences business strategy. This implies that a multidimensional rather than the traditional unidimensional conceptualization of strategic IT alignment is appropriate. To validate this approach we develop and test a new multidimensional measure that captures the first-order effects of IT alignment at the process-level, where they are expected to be realized. We test the model using survey data from 94 companies that span three countries — US, Australia and Germany. Results reveal that the multidimensional measure of strategic IT alignment is a better predictor of both business unit agility and performance than the unidimensional measure of strategic IT alignment.*

### Keywords

Strategic IT alignment, construct dimensionality, construct conceptualization, construct measurement.

### INTRODUCTION

Strategic information technology (IT) alignment has been the subject of considerable scholarly attention producing an extensive body of empirical research<sup>1</sup>. Much has been learned and yet IT alignment remains a top concern for practitioners and scholars alike (Tallon 2008; Yayla and Hu 2012). An examination of the literature shows that IT alignment can be conceptualized in a number of different ways. For instance, it has been conceptualized at the firm level of analysis either as a unidimensional or multidimensional phenomenon. While Sabherwal and Chan (2001) and Chan et al. (2006) specify IT alignment as a unidimensional construct based on the degree of *fit* between firm-level business strategy and IT strategy, Kearns and Lederer (2000) focus on firm-level strategy plans to disaggregate IT alignment into two distinct dimensions, i.e. ‘alignment of the IS plan with the business plan’ and ‘alignment of the business plan with the IS plan’.

More recently, researchers have argued that examining IT alignment at the process level of analysis may provide additional insights into the phenomenon, and may even be a more appropriate approach for observing the strategic effects of IT (Tallon 2008). Accordingly, the literature on IT alignment has recently begun to employ a process-oriented approach to examine the effects of alignment (Tallon and Pinsonneault 2011). The emerging literature on process-oriented IT alignment has uncovered important insights on the relationship between alignment and firm performance. For example, previous studies undertaken at the firm-level found that IT alignment effects firm performance directly (Chan et al. 2006; Sabherwal and Chan 2001). However, recent process-oriented IT alignment research found no direct effect of IT alignment on performance (Tallon and Pinsonneault 2011). In particular, Tallon and Pinsonneault (2011) found that the effect of alignment on firm performance is indirect and mediated by firm agility. Their study highlights that agility, defined as “the ability to detect and seize market opportunities with speed and surprise” (Sambamurthy et al. 2003, p. 238), is both an important outcome of IT alignment and a key enabler of firm performance.

The process-oriented approach to IT alignment departs from traditional firm-level research by visualizing business strategy through a series of business processes in the value chain. As Tallon (2008) explains, this

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<sup>1</sup> For ease of expression we also refer to strategic IT alignment as *alignment* or *IT alignment*.

approach views alignment in terms of the links between business processes and IT use, which are “process-level manifestations of how firm-level strategies are executed” (p. 255). Importantly, prior studies did not provide a formal conceptualization of the process-oriented IT alignment construct. Instead, they have employed a firm-level definition, i.e. “the interaction or fit between IT and business strategy” (Tallon 2008, p. 228), and measured the construct based on either of two distinct forms of *fit*: profile deviation and moderation (Tallon 2008). While *profile deviation* is focused on the absolute distance between two strategy variables, *moderation* is focused on the product term between two variables (Tallon 2008). As Edwards (1994) explains, these measures present “substantive and methodological problems” (p. 51). Specifically, these measures cannot be unambiguously interpreted because they are *directionless* (Edwards 1994). Thus, it is difficult to distinguish between *directional* relationships that characterize IT alignment (1) from the business to the IT, and (2) from the IT to the business. Hence, alignment is typically operationalized as a unidimensional construct that may be suboptimal<sup>2</sup>.

While the emerging literature on IT alignment suggests that the process-oriented approach is a promising avenue for further research, it neither provides a formal conceptualization of process-oriented alignment nor examines what new insights could be uncovered by employing a multidimensional measure of the construct. This is the focus of the current study. This paper develops a multidimensional conceptualization of process-oriented IT alignment and provides measures for the construct. We build upon existing research that suggests that IT alignment is a complex phenomenon that is too broad to be conceptualized as a first-order unidimensional construct (see for example, Ciborra 1997; Hirschheim and Sabherwal 2001; Tallon and Kraemer 2003). According to this perspective, alignment can be conceptualized as a higher-order (multidimensional) construct that comprises two dimensions: (1) alignment of the business with the IT, and (2) alignment of the IT with the business. Failure to include both dimensions implies that important insights regarding the nature of alignment and its performance effects might be lost.

To empirically validate this work, we investigate how the new multidimensional construct and the existing construct compare when testing theory. Our approach builds upon emerging theory of the effect of alignment on performance. In particular, recent literature shows that the effect of alignment on performance is not direct but indirect and mediated by business agility (Tallon and Pinsonneault 2011). Accordingly, we examine the multidimensional and unidimensional conceptualizations of process-oriented IT alignment by placing both constructs in a nomological network predicting business agility and performance. This allows us not only to compare the impact of the different ways in which IT alignment is conceptualized but also to test the relationship between the new multidimensional IT alignment construct, business agility and performance.

This study contributes to the literature on process-oriented IT alignment in three respects. First, it develops and tests a new multidimensional conceptualization of process-oriented IT alignment, which has not been done previously. Second, in analyzing data from a survey of executives in 94 firms, we find that multidimensional IT alignment is positively associated with agility and that agility fully mediates the relationship between multidimensional alignment and performance. Finally, the unidimensional conceptualization reveals neither a direct positive effect of alignment on agility nor an indirect effect of alignment on performance (mediated by agility). The results from this study including US, Australian and German firms indicate that the multidimensional IT alignment measure is a better predictor of business agility and performance.

## LIMITATIONS OF UNIDIMENSIONAL PROCESS-ORIENTED IT ALIGNMENT

The process-oriented approach to IT alignment emphasizes the importance of gaining a deeper understanding of where alignment matters most (i.e., business processes in the value chain). For example, Tallon (2008) measures alignment across five primary value chain processes: supplier relations (inbound logistics); production and operations; product and service enhancement; sales and marketing; and customer relations (outbound logistics). This stream of research yields a more detailed and comprehensive understanding of the relationship between alignment and firm performance. In particular, recent research indicates that the relationship between alignment and performance, previously found to be direct and positive (Chan et al. 2006; Sabherwal and Chan 2001), may need to be revisited. For example, Tallon and Pinsonneault (2011) show that the effect of process-oriented IT alignment on performance is not direct but indirect and fully mediated by firm agility.

Traditionally, process-oriented IT alignment has been conceptualized as a unidimensional construct based on one of two distinct forms of fit: 1) profile deviation and 2) moderation<sup>3</sup>. With *profile deviation* the focus is on the absolute distance between actual and ideal levels of IT use across processes, while *moderation* is focused on the product term between two variables: “business activity orientation” and “IT use” (Tallon 2008). The “business activity orientation” variable refers to the extent to which key activities of each process in the value chain are implemented by the firm, while “IT use” refers to the extent to which the firm’s IT capabilities are actually used

<sup>2</sup> See Polites et al. (2012, p. 33) for a theoretical discussion on why forms of fit such as moderation and profile deviation are unidimensional construct specifications.

<sup>3</sup> Hereafter we refer to the traditional fit-based alignment approach as ‘unidimensional IT alignment’.

to support the business. “Moderation” specifies alignment based on the product of each measure of IT use and its equivalent process-oriented measure of business activity orientation. This form of fit is criterion-specific and hypotheses are derived based on the level of interaction between “business activities orientation” and “IT use”. It is assumed that this interaction will positively affect the criterion variable (performance, say).

Researchers have identified methodological pitfalls with the moderation approach. For example, fit as moderation imposes a linear correspondence between the independent and criterion variables in the moderation model, a condition that is rarely explicitly tested (Meilich 2006). The unidimensional IT alignment scores can also be ambiguous and difficult to interpret because different levels of the variables in the tuple (business activity orientation, IT use) might result in the same interaction effect (Oh and Pinsonneault 2007). For example, the tuples (6, 2) and (3, 4) result in the same interaction effect, because the product “business activity orientation  $\times$  IT use” in each case yield the same score. The profile deviation approach looks at the absolute distance between the actual levels of “IT use” and an expert-generated IT use profile which distinguishes between three different strategic orientations: operational excellence, customer intimacy and product leadership (Tallon 2008). Researchers have also questioned the validity of these measures, because different levels of IT use for a given business process might yield the same alignment score (Oh and Pinsonneault 2007). For example, low and high levels of actual IT use will result in the same alignment score, provided their absolute distance to the ideal IT use profile is the same. Overall, our analysis of the literature reveals important limitations with the unidimensional approach to IT alignment. Not surprisingly, researchers have recently drawn attention to direct measurement scales that overcome problems associated with fit indices (Yayla and Hu 2012).

## CONCEPTUAL DEVELOPMENT

### Conceptualization of Multidimensional IT Alignment

Prior research on the interaction between strategy and IT indicates that, at any given point in time, strategy capitalizes on IT based on a mutual alignment relationship (Itami and Numagami 1992). This implies that IT not only supports the strategy but it is also influenced by the strategy. More recently, Sirmon et al. (2011) has emphasized the managerial capabilities needed to capitalize on the interaction between strategy and organizational resources such as IT. In particular, they draw attention to resource management activities that are required for developing and maintaining superior strategies (Sirmon et al. 2011). These activities involve “structuring the firm’s portfolio of resources, bundling those resources into capabilities, and leveraging the capabilities to realize competitive advantage” (Sirmon et al. 2011, p. 1406). In the context of IT alignment, managerial choices would seek to build and maintain adequate IT capabilities to *support* the business strategy, which in turn, must *leverage* existing IT capabilities to derive benefit. This is in line with extant IT alignment research that identifies two distinct facets of the alignment phenomenon: “alignment from the business to the IT” and “alignment from the IT to the business” (Kearns and Lederer 2003; Tallon and Kraemer 2003). For instance, Tallon and Kraemer (2003) distinguish between these facets by conceptualizing IT alignment based on two dimensions: IT support (the extent to which IT *supports* the business strategy) and IT utilization (the extent to which the strategy *leverages* available IT). This implies that IT alignment can be modeled as a multidimensional construct because *IT support* and *IT utilization* are treated as distinct but related dimensions that specify a single theoretical concept (Edwards 2001; Polites et al. 2012).

By drawing upon this theoretical base, we can assess these two dimensions (namely *IT support* and *IT utilization*) across primary organizational processes to conceptualize the process-oriented multidimensional IT alignment construct. This theoretical base is particularly suitable for a process-oriented conceptualization of alignment because it “explicitly addresses process-oriented managerial actions that are involved in achieving competitive advantage as well as creating value” (Sirmon et al. 2011, p. 1391). To develop the theoretical definition of multidimensional IT alignment, we explicitly distinguish between *IT support* and *IT utilization*. While *IT support* refers to the level to which a firm’s IT capabilities meet the IT needs of strategic business processes, *IT utilization* concerns the extent to which those business processes leverage available IT capabilities. Then, we build upon work by Tallon (2008) and Tallon and Pinsonneault (2011) to assess these two dimensions across five primary strategic processes in the value chain, i.e., supplier relationship management (SRM); product/service operations; product/service innovation; sales and marketing; and customer relations (CRM).

The theoretical definition of process-oriented multidimensional IT alignment, based on the IT support and IT utilization dimensions, can then be written as: *the extent to which available IT supports the primary business processes that execute the business strategy (that is, supplier relationship management, product/service operations, product/service innovation, sales and marketing, and customer relations), and the extent that those business processes utilize available IT.*

We propose that this construct is best operationalized as a second-order construct. In particular, we followed Jarvis et al.’s (2003) criteria to specify the construct as a second-order formative index. The calculation of such an index requires that the IT support and IT utilization dimensions be modeled as first-order formative

components rather than reflective factors. When reflective factors are used, the construct is assumed to cause the first-order factors. In contrast, when the construct is measured using formative components, the components are assumed to form the construct. Thus, the multidimensional alignment index is comprised of two components, IT support and IT utilization, that influence the underlying construct rather than being influenced by it. It is appropriate to conceptualize and measure this construct as an index because changes in any of the two components would cause a change in the alignment index. Furthermore, a change in one of the components is not necessarily accompanied by changes in the other (Jarvis et al. 2003).

### Hypotheses Development

IT alignment has been repeatedly found to improve firm performance (Chan et al. 2006; Sabherwal and Chan 2001). More recently, researchers have found that it affects agility, which is a key imperative for business success (Tallon and Pinsonneault 2011). However, further theoretical development and empirical testing of the relationship between IT alignment, agility and performance is hampered by the absence of robust conceptualizations and measures of alignment. In particular, the traditional unidimensional measures of alignment have important problems (see the section 'Limitations of Unidimensional Process-Oriented IT Alignment') and the theory-testing implications of these problems remain unclear. Further, researchers have argued that the alignment construct is too complex to be conceptualized as unidimensional (Ciborra 1997; Hirschheim and Sabherwal 2001). For example, Ciborra argues that technology is no longer passive but it shapes strategy and other business activities. Hence, the question "who is aligning whom" should not be neglected (1997, p. 76). The above discussion has important implications for theory testing because an ambiguous, incomplete or restricted portrayal of the IT alignment construct can limit our understanding of its relationships with agility and business performance. This implies that the unidimensional approach to IT alignment may prevent researchers from accurately capturing important effects of IT alignment. On the other hand, a multidimensional conceptualization of IT alignment that captures the complexity of the phenomenon – "from the business to the IT" and "from the IT to the business" – is more likely to accurately predict the effects of IT alignment on agility and business performance. We highlight this prediction in the following pair of hypotheses:

- H1: Multidimensional IT alignment has a stronger effect on agility than unidimensional IT alignment.*
- H2: Multidimensional IT alignment has a stronger effect on business performance than unidimensional IT alignment.*

The IT alignment literature has reached a level of sophistication and development that researchers are increasingly interested in detecting not only the main effects of IT alignment on business performance, but also mediating effects. For example, recent research has investigated moderator and mediating variables that affect the relationship between alignment and performance (Tallon and Pinsonneault 2011; Yayla and Hu 2012). In particular, researchers have argued that the performance implications of alignment lie in the extent to which it enables firms to be more agile in responding to market changes (Tallon and Pinsonneault 2011). If this is the case, agility might function as a mediator of the relationship between alignment and performance. However, in view of the earlier discussion of the problems associated with the unidimensional approach to IT alignment, we posit that the multidimensional conceptualization of IT alignment is better suited to accurately predict the mediating role of agility in the relationship between alignment and performance. We further posit that multidimensional IT alignment is a better predictor of the indirect effect of alignment on performance than unidimensional IT alignment. Thus, we hypothesize the following:

- H3: Agility positively mediates the relationship between multidimensional IT alignment and firm performance.*
- H4: Multidimensional IT alignment has a stronger indirect effect on firm performance via agility than unidimensional IT Alignment.*

## METHODOLOGY

### Sample Characteristics and Data Collection

We tested our hypotheses on a cross-sectional sample of firms based in the United States, Germany and Australia. This global sample includes financial services, energy, IT and communications, manufacturing, wholesale and retail companies. The business unit was the unit of analysis. We identified a competent key informant as: chief information officer or management executive at the general manager level in a business unit. Respondents were randomly sourced from a commercial contact list. One hundred and two executives responded to our survey questionnaire, yielding a 9% response rate. Eliminating responses with missing data left 94 respondents. Nearly one third of the firms were service related firms (30 firms), followed by banking (19 firms), manufacturing (14 firms), wholesale and retail trade (12), IT services (11) and various other retail firms (14 firms). The median business unit in our data had 500 employees. Our sample distribution includes a

representative portion of firms that are traditional users of IT. This provides confidence that the sample is sufficiently representative of the population strata to support hypothesis testing.

### The Measures

We developed a survey instrument (Appendix 1) to collect data for validating the main constructs and testing our research hypotheses. The measures of agility, unidimensional IT alignment, and business performance have been taken from the literature. The measures of multidimensional IT alignment were developed for the purposes of this study. To strengthen our tests, we controlled for strategic orientation and industry type. All measures were refined using qualitative feedback derived from a pilot test of senior executives and prominent academics at the Centre for Information Systems Research at MIT.

The *multidimensional IT alignment* construct was measured as a Type II second-order formative index (Jarvis et al. 2003) comprised of two components: IT support and IT leveraging. To develop the scales for the first-order components, we undertook an extensive expert content analysis. The analysis was based on four steps. First, semi-structured interviews were held with senior IT and business executives of three leading businesses in different industries to gain richer insights into the phenomenon being measured. Second, the set of items developed for measuring the two components were pilot tested. Third, the refined items were presented to three experts in the area of strategic management of IT (two academics and one senior executive), who evaluated the items for their relevance and representativeness. The expert opinions provide confidence that the items are relevant and representative. Finally, a Q-sorting exercise was undertaken with six academics and five executives to further assess the relevance and representativeness of the items. We found that each item is representative of the component it is supposed to measure.

We measured the *agility* construct employing an adapted version of Tallon and Pinsonneault's (2011) eight-item measurement scale. This scale assesses the ability of a business unit to easily and quickly respond to market changes (in relation to competitors) in each of three areas: customer demand, innovation, and pricing. Similarly, our *performance* measures were concerned with the business unit's performance relative to its competition. We adapted the five-item performance scale from Powell and Dent-Micallef (1997). Consistent with prior research on the business unit level of analysis (Chan et al. 1997) – where it is hard to collect objective performance data, this scale was designed as a subjective measure of financial performance, consisting of questions about the business unit's profitability, sales growth, revenue and market share in relation to competitors.

As noted previously, *unidimensional IT alignment* has been traditionally measured based on fit as moderation or profile deviation. Prior research shows that these measures yield similar results (Tallon 2008). More recently, researchers have favored profile deviation as it yields an easily understandable measure of the distance between an actual and ideal IT strategy where the ideal IT strategy is operationalized as the level of IT use that ensures perfect alignment for the current business strategy (Tallon 2012). To measure unidimensional IT alignment based on profile deviation, we followed the approach in Tallon (2012) that is based on the five-step procedure described in Tallon (2008). First, a baseline ideal IT use profile is defined to specify the extent to which IT should ideally be used in critical areas of the value chain. The IT use profile developed by Tallon (2008) was employed in this study. Second, the strategic orientation of each business unit is measured. Third, an ideal IT use profile is computed for each business unit based on its strategic orientation and the pre-defined IT use profile. Fourth, the extent to which each business unit actually uses IT to support its primary processes in the value chain is measured. Finally, the absolute deviation between actual IT use (fourth step) and ideal IT use (third step) is computed for each business unit. The absolute deviation is then used as the unidimensional alignment index.

### DATA ANALYSIS AND RESULTS

Data analysis was conducted with partial least squares (PLS), a structural equation modeling technique that uses a principal-component-based estimation approach (Chin 1998). The following three features make PLS especially appropriate to this study. First, PLS is advantageous compared to covariance-based-structural equation modeling when analyzing predictive research models that are in the early stages of theory development. This is the case of the current research. To the best of our knowledge, no prior research has operationalized and tested a multidimensional conceptualization of IT alignment. Second, PLS allows researchers to more easily specify both reflective and formative constructs (Chin 1998). As discussed previously, the current study develops a formative index to measure multidimensional IT alignment. Third, PLS is more appropriate when dealing with small sample sizes. This is relevant for this study, as our sample size was 94 observations. Obtaining survey responses from the C-level executives sampled in this study is difficult and the sample size is comparable to other studies of IT alignment (Oh and Pinsonneault 2007).

### Assessing the Measurement Model

To ensure the validity of all measures, we examined non-response bias, common method bias and convergent and discriminant validity. We also examined the correlation between our subjective measure of performance and objective performance data collected for 43% of our sample. To test for non-response bias, we used the extrapolation procedure proposed by Armstrong and Overton (1977). No systematic differences existed between early and late respondents and across countries, suggesting that non-response bias is not a major concern. To assess common method bias we applied Harmon's ex post one-factor test (Podsakoff and Organ 1986). The results of this test indicated that we needed 24 distinct factors to explain 82 percent of the variance, with the largest factor accounting for 18 percent of the variance. The lack of a dominant single factor suggests that common factor bias is probably not an issue.

Exploratory analyses of the underlying questionnaire items were undertaken to assess construct-to-item loadings, cross-loadings, Cronbach's alphas, composite reliabilities, and the average variance extracted for each construct in the model. This enabled us to assess reliability, internal consistency, and discriminant validity for each measure included in the study. Table 1 displays validity and reliability statistics and the correlation matrix.

Table 1. Correlation between Constructs

	CA	CR	AVE	1	2	3	4	5	6
1. Agility	0.85	0.88	0.50	<b>(0.71)</b>					
2. Unidimensional IT Alignment <sup>a</sup>	n.a.	n.a.	n.a.	0.13	n.a.				
3. IT Utilization	0.83	0.88	0.60	0.43	0.08	<b>(0.77)</b>			
4. Business Performance	0.89	0.92	0.71	0.42	-0.02	0.27	<b>(0.84)</b>		
5. IT Support	0.82	0.87	0.58	0.45	0.20	0.79	0.28	<b>(0.76)</b>	
6. Multidimensional IT Alignment <sup>b</sup>	n.a.	n.a.	n.a.	0.46	0.14	0.95	0.29	0.95	<b>n.a.</b>

*Notes:*

CA = Cronbach's alpha; CR = Composite Reliability; AVE = Average Variance Extracted; n.a. = not applicable; The **bold** numbers on the diagonal are the square root of the AVE; Off-diagonal elements are correlations among constructs; <sup>a</sup> The measure is computed using the five-step profile deviation approach described in Tallon (2008); <sup>b</sup> Second-order formative construct with two first-order components, IT Support and IT Utilization.

In order to assess the *reliability* of each reflective measure in the study, we examined how each item relates to the latent constructs. We found that all of the loadings for the measures in the study are significant ( $p < 0.01$ ) and load more highly on their own construct than on others. These results provide support for the reliability of the reflective measures. In the case of formative components, one examines weights (instead of loadings) – which represent a canonical correlation analysis and provide information about how each formative component contributes to the respective construct. We found that the formative first-order components of the second-order construct multidimensional IT alignment are significant and salient contributors to the alignment index (IT support weight = 0.52; IT utilization weight = 0.54).

*Internal consistency* is assessed using Cronbach's alpha and composite reliability. Nunnally (1978) suggests 0.70 for reliability applicable in early stages of research development and 0.8 for established basic research. As shown in Table 1, alpha of each set of reflective measures in the study exceeds 0.82 and composite reliability exceeds 0.87 for all measures, suggesting good internal consistency. To assess *discriminant validity* we examined the Average Variance Extracted (AVE), which indicates the amount of variance that is captured by the construct in relation to the variance due to measurement error. Values for AVE greater than 0.50 are desirable because they suggest that the constructs account for the majority of the variance in their indicators. As shown in Table 1, all AVE values are greater than 0.50. Next, we compared the square root of the AVE (the diagonal values in Table 1) with the off-diagonal correlations to demonstrate discriminant validity (Fornell and Larcker 1981). The square root of the AVE for all the reflective constructs exceed 0.71 and each (except for the IT support construct in relation to IT utilization) is greater than off-diagonal elements that represent correlation between the constructs. Thus, it is possible to conclude that each reflective measure is tapping a distinct and different construct. For completeness, Table 1 also includes the unidimensional and multidimensional alignment index measures.



In the case of the IT support and IT leveraging constructs, further discriminant analysis is desirable because they are modeled as first-order formative components of a second-order construct. In other words, the formative specification requires that the two components be conceptually distinct<sup>4</sup>. A Q-sorting exercise was used to evaluate the IT support and IT utilization components and their measures. The exercise was undertaken with five senior executives and six academics and the results indicated that respondents can discriminate between the two components and that each measure examined is representative of the component it is supposed to measure.

### Assessing the Structural Relationships

We assessed the path coefficients and their significance values to test the derived hypotheses. To do so we applied the bootstrapping procedure (with a number of 500 bootstrap samples and 94 bootstrap cases) to evaluate the significance of the paths. The results are depicted in Figure 1.

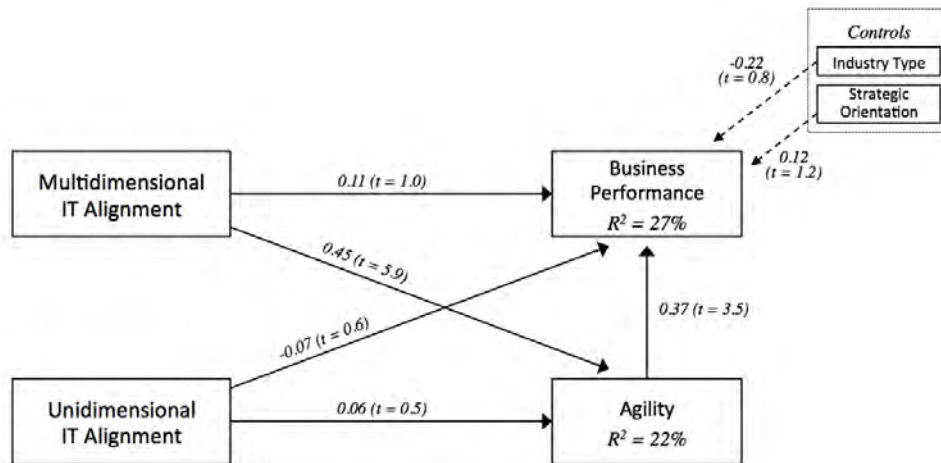


Figure 1. Information on the Structural Model

The strongest path shows a positive and significant effect of multidimensional IT alignment on agility ( $\beta = 0.45$ ;  $p < 0.001$ ). On the other hand, and perhaps the most interesting result in Figure 1, the effect of unidimensional IT alignment on agility is not significant ( $\beta = 0.06$ ;  $p = \text{n/s}$ ). These results not only support Hypothesis 1 but also show that the differences between multidimensional alignment and unidimensional alignment are incommensurable when predicting agility. On the other hand, our analysis reveals that neither multidimensional alignment nor unidirectional alignment effects performance, thus rejecting Hypothesis 2. This is consistent with recent studies that show that alignment has no direct effect on performance (Tallon and Pinsonneault 2011).

To test Hypotheses 3 and 4, we first examine the relationship between agility and business performance. We found that the effect of agility on business performance is positive and significant ( $\beta = 0.37$ ;  $p < 0.001$ ). To test for significance of the mediation effect of agility on the relationship between alignment and business performance, the  $z$ -statistic (Sobel 1982) is applied. We found that multidimensional IT alignment has a significant indirect effect on business performance (mediated by agility), as indicated by a Sobel test ( $z = 3.04$ ,  $p < 0.01$ ). Thus, Hypothesis 3 is supported. Finally, we have found that unidimensional IT alignment has no indirect effect on business performance ( $z = 0.5$ ;  $p = \text{n/s}$ ), thus supporting Hypothesis 4.

To identify whether agility completely or partially mediates the relationship between multidimensional IT alignment and performance, we examine the direct effect when the mediator is present in the model and also when the mediator is removed from the model. We found that the direct effect is significant when the mediator is removed from the model ( $\beta = 0.28$ ,  $p < 0.01$ ) but insignificant when the mediator is included ( $\beta = 0.11$ ;  $p = \text{n/s}$ ). Hence, our results indicate that agility *fully* mediates the relationship between multidimensional IT alignment and business performance. This mediation effect has also been refereed to as *indirect-only mediation*. As Zhao et al. (2010) explain, indirect-only mediation occurs when the indirect effect is significant ( $z = 3.04$ ,  $p < 0.01$ ) and the direct effect is not ( $\beta = 0.11$ ;  $p = \text{n/s}$ ).

### DISCUSSION AND CONCLUSION

In an important contribution to the art of how to make a theoretical contribution in the IS discipline, Weber (2003, p. vii) states that “The most fundamental components of a theory are its constructs. Recall the constructs represent the properties of things.” This paper makes a theoretical contribution by: (1) defining the focal

<sup>4</sup> Empirically, the first-order formative components of the second-order construct may be completely uncorrelated, moderately correlated or highly correlated (Jarvis et al. 2003).

construct of an existing theory more precisely or perhaps conceptualize it in a somewhat different way, (2) articulate the measurement properties of a new focal construct, and (3) conceive of the IT alignment phenomenon in a different and hopefully better way. We address all three in turn.

Our first contribution is the development and testing of a multidimensional conceptualization of IT alignment, which has not been done previously. Thus, we respond to calls in the literature for scholars to embrace a multidimensional rather than unidimensional approach to IT alignment (Ciborra 1997; Hirschheim and Sabherwal 2001; Tallon and Kraemer 2003).

Second, we show that IT alignment has been measured based on unidimensional approaches that have been shown to be problematic. These issues have important implications for scholarly theorizing about the form of IT alignment and its performance effects. This study identifies, discusses and accounts for these issues. We advance a new multidimensional measure that overcomes limitations associated with traditional unidimensional measures. The results of an extensive expert content analysis (which included several interviews with senior executives, expert opinion and a Q-sort exercise with executives and academics) confirm the adequacy of the developed measure. Further, in analyzing data from a survey of executives in 94 firms, we find that the new measure is valid and reliable.

Finally, we have demonstrated the empirical relevance of the new measure by comparing multidimensional IT alignment to unidimensional alignment in a simple nomological network that comprises agility and business performance. Our results show that multidimensional IT alignment is positively associated with agility and that agility fully mediates the relationship between multidimensional IT alignment and business performance. Our results also reveal that neither the direct positive effect of alignment on agility nor the indirect effect of alignment on business performance (mediated by agility) can be realized when employing the unidimensional measure of IT alignment. This implies that the new multidimensional measure of IT alignment is a better predictor of both agility and business performance than the unidimensional measure. These results also suggest that important insights regarding the nature of alignment and its performance effects can be lost due to restricted portrayal of IT alignment as a unidimensional construct.

This study reveals that a new multidimensional measure of process-oriented IT alignment can outperform the more traditional unidimensional approach. It builds a more managerially relevant theory of the effect of multidimensional IT alignment on performance and provides a platform for future theory development.

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## ACKNOWLEDGEMENTS

This research was supported by a Discovery grant awarded by the Australian Research Council.

## APPENDIX 1

AG: Agility (1: Strongly disagree; 5: Strongly agree)

*Compared to our three nearest competitors, my business unit can more easily and quickly...*

AG1: Respond to changes in aggregate customer demand.

AG2: Customize a product/service to suit an individual customer.

AG3: React to new product/service launches in the market.

AG4: Introduce new pricing schedules in response to changes in competitor's prices.

AG5: Expand into new regional and/or international markets.

AG6: Expand or reduce the variety of products/services available for sale.

AG7: Adopt new technologies to increase the throughput of products/services.

AG8: Switch suppliers or partners.

PER: Business Performance (1: Strongly disagree; 5: Strongly agree)

PER1: We are more profitable than our competitors.

PER2: Our sales growth exceeds that of our competitors.

PER3: Our revenue growth exceeds that of our competitors.

PER4: Our market share growth exceeds that of our competitors.

PER5: Overall, our performance is better than our competitors.

SUP: IT Support (1: Not at all; 5: Fully)

*To what extent are your organization's current IT capabilities able to meet the IT needs of the following business unit processes?*

SUP1: Supplier relationship management (SRM).

SUP2: Product/service operations.

SUP3: Product/service innovation.

SUP4: Sales and marketing.

SUP5: Customer relations (CRM).

UTI: IT Utilization (1: Not at all; 5: Fully)

*To what extent do the following business unit processes leverage currently available IT capabilities?*

UTI1: Supplier relationship management (SRM).

UTI2: Product/service operations.

UTI3: Product/service innovation.

UTI4: Sales and marketing.

UTI5: Customer relations (CRM).

USE: IT Use (1: Not at all; 5: To a great extent)

*To what extent is IT used to support key business activities in each of the following business unit processes? Please limit your appraisal to the extent of IT use rather than the quality of support.*

USE1: Supplier relationship management (SRM).

USE2: Product/service operations.

USE3: Product/service innovation.

USE4: Sales and marketing.

USE5: Customer relations (CRM).

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